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last position, and especially with reference to the angle, because all the preceding positions can be represented by other ellipses. If the correctness of this position is confirmed by future measures, as it doubtless will be, there can be little change in these elements.

A New Quadruple Stellar System. By R. T. A. Innes.

The star *κ Toucani* was discovered to be double by Sir John Herschel on the night of 1834 November 3 with his 18-inch reflecting telescope. He remarks, "Very beautiful, excellent and careful measures with power 320 and triangular aperture."

His reflector measures are—

1834·84	12°·0	2″	6½ and 9
1834·90	11·3	2½	6 ,, 9

He measured it again in 1836 with his 5-inch refractor, getting

1836·64	17°·8	5″·78	5½ and 11
1836·91	14·2	4·24	6½ ,, 10

Amongst later measures may be cited

1871·9	0°·0	5″·19	H. C. Russell, Sydney.
1894·9	354·8	5·52	John Tebbutt, Windsor, N.S.W.

The comparison is also to be found in the Cordoba General Catalogue, being called 7th magnitude there.

The magnitudes may be taken as 5·6 and 7·8, the companion being of a purple colour.

The above measures alone would not prove physical connection, but the large proper motion of *κ Toucani* 0″·407 towards 86°·2 puts it beyond doubt.

The star Lac. 353, mag. 7·3, is 5′ 20″·0 north preceding *κ Toucani*. Whilst observing it in 1895 with a reflecting telescope made by Mr. F. Dixon Edmonds, an amateur, residing in Sydney, I noticed that it was also a double star (No. 27 of the list given on p. 262 of vol. vi. of the *Journal of the British Astronomical Association*).

An estimate made at that time gave

1895·8	180°	1″ ±

and one made here with the 7-inch refractor is

1896·8	185°	1″·4 ±

magnitudes 7·7 and 8·7.

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I have since found that this pair shares in the proper motion of κ *Toucani* and its companion.

As the older catalogues are not very accurate I have preferred to exhibit the results given in this way. From the recorded positions of Lac. 353 I have subtracted the positions given in the same catalogues of κ *Toucani*, getting for the equinox of 1900.

				Proper Motion of κ *Toucani* since 1752.	
		Δ α	Δ δ	α	δ
		s	′ ″	s	″
Lacaille	1752	−46·57	+3 46·1	+ 0·00	+ 0·0
Brisbane	1825	−47·37	3 15·9	5·53	6·1
Cape	1835·8	...	3 24·1	6·34	7·0
Gilliss	1851·9	−46·24	3 21·9	7·57	8·4
Cape	1874·8	−46·59	3 23·9	9·30	10·2
Cordoba	1875·0	−46·32	3 23·4	9·31	10·3
	1896·9	−46·71	3 23·1	10·97	12·1

The differences for 1896·9 result from a comparison with κ *Toucani* with the 7-inch equatorial, Lac. 353 being found in no later catalogue than the C. G. Arg.

The proper motion of κ *Toucani* used is +0ˢ·0757 in R.A. and +0″·0835 in Dec.; in this determination, which is a preliminary one, recent Cape meridian observations have been included.

If Lac. 353 had no proper motion its distances from κ *Toucani* should have been as follows—starting from 1752:—

	Δ α	Δ δ		Δ α	Δ δ
	s	′ ″		s	′ ″
Lacaille	−46·57	+3 [46·1]	Cape	−55·89	+3 13·7
Brisbane	52·90	3 [9·8]	Cordoba	55·63	3 13·1
Cape	...	3 17·2	1896·9	57·68	3 11·0
Gilliss	53·81	3 13·6			

Hence we may reasonably infer that the pairs κ *Toucani* and Lac. 353 are physically connected. I know of no similar system.

The circumstances of these stars give some hopes of a measurable parallax.

Finally, it will be obvious that when the periods of both pairs are known, the common period of the system will be found as soon as the direction of motion of one pair around the other is known.

Royal Observatory, Cape of Good Hope:
1897 *February* 24.

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On the determination of the Epoch-Correction of an adopted system of Right Ascensions of Clock Stars from observations of the Sun, including the effects of personalities; and applications of the results to the determination of the errors of the Tables of the Sun and Moon. By E. J. Stone, M.A., F.R.S., Radcliffe Observer.

There are few points in practical astronomical work which involve more delicate considerations than those connected with the determination of the absolute corrections required by the right ascensions of our Clock Stars, and the determination of the errors of the Tables of the Sun in longitude. I propose to give in the present paper some results on this subject to which I have been led, and some practical applications.

In an investigation of this kind it is necessary to accurately define the physical meanings of the symbols employed; and the notation which I have adopted is as follows:—

θ, λ, ω denote the longitude and latitude of the Sun's centre, and the "Obliquity of the Ecliptic," computed from a set of Solar Tables with an assigned value of the variable, t.

$\theta+\delta\theta$, $\lambda+\delta\lambda$, $\omega+\delta\omega$ denote the corresponding exact values.

α, Δ denote the corresponding tabular R.A. and N.P.D. computed in the usual way from the values of θ, λ, ω.

α', Δ' are the R.A. and N.P.D. of the Sun's centre as found directly from observation; and to which the variable, t, with which the tabular places are computed, is assumed to correspond.

$\alpha'+x$, $\Delta'+y$ are the exact values of the R.A. and N.P.D.

θ', λ' are the longitude and latitude of the Sun's centre from observation as found from α', Δ', and ω.

$\theta'+\delta\theta'$, $\lambda'+\delta\lambda'$ are the exact values of the longitude and latitude of the Sun's centre.

We have, therefore, $\theta+\delta\theta=\theta'+\delta\theta'$; $\lambda+\delta\lambda=\lambda'+\delta\lambda'$ identically.

The systematic errors in R.A., x, with which we shall be principally concerned arise from

(1) Errors in the adopted R.A. of the clock stars.

(2) Differences in personalities in the observations of transits of stars and limbs of the Sun.

The systematic errors in N.P.D., y, will be chiefly due to

(3) Errors in the adopted latitudes of the observing stations.

(4) Uncorrected division-errors of the circles.

(5) Personalities on the part of the observers.

(6) Errors of the adopted refraction tables.